

THE  
ATLANTIC OCEAN TELEGRAPH

FROM

IRELAND TO NEWFOUNDLAND,

OR

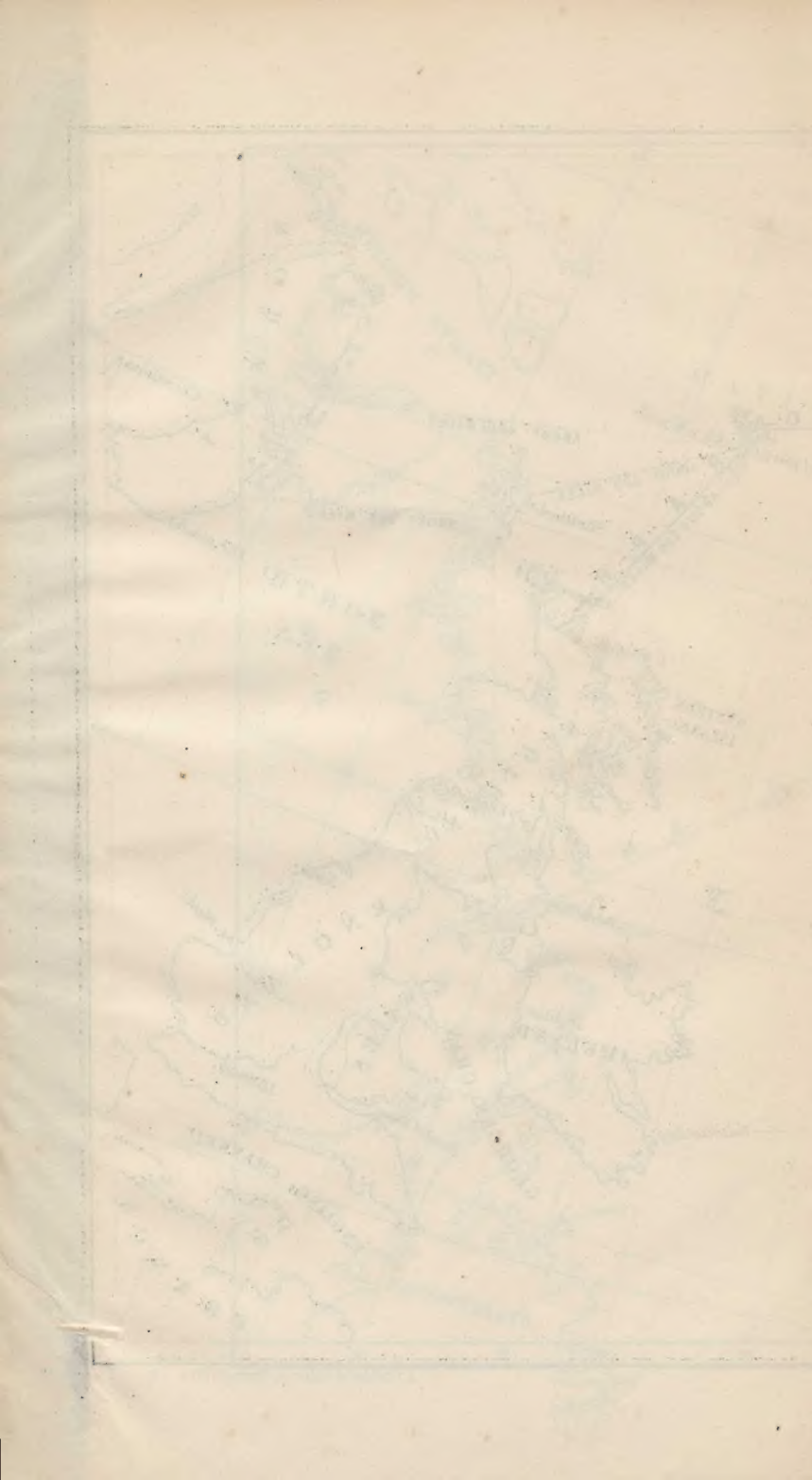
THE NORTH ATLANTIC LINE,

VIA FAROE ISLANDS, ICELAND, GREENLAND, AND LABRADOR.

PRICE ONE SHILLING.













THE  
ATLANTIC OCEAN TELEGRAPH

FROM  
IRELAND TO NEWFOUNDLAND,

OR  
THE NORTH ATLANTIC LINE.

VIA FAROE ISLANDS, ICELAND, GREENLAND, AND LABRADOR.

BY  
JOHN ROBINSON, C.E.,  
TELEGRAPH ENGINEER.

*Landsbókasafn  
(Göf Thoroddsens)*

LONDON:  
J. HADDON, PRINTER, 3, BOUVERIE STREET, FLEET STREET.

1860.

*Price One Shilling.*

111030



## ATLANTIC TELEGRAPHY.

---

EARLY intelligence is the life and soul of commercial enterprise ; whatever tends to diminish time in rapidity of communication must inevitably give a great impetus to commerce ; and do more to promote civilization, kindly feeling, and good-will, than all the Peace Societies ever formed, or all the protocols and negotiations ever concocted or devised by subtle diplomatists.

To no country is early intelligence of such vast importance as Great Britain, with commercial relations extending to every quarter of the globe ; with territorial dominions on which it has been truly said the sun never sets, we strain every nerve to acquire rapidity of intelligence. Let there be but the possibility of gaining twenty-four hours in the transmission of letters between this country and India, China, Australia, or our colonies, we ungrudgingly and cheerfully give thousands of pounds annually to obtain this great desideratum. We gladly pay twelve or fifteen thousand pounds annually to secure twelve hours more for the transmission of letters to America *viâ* Queenstown, and would not grudge as much more for another twelve hours. Money in such cases is no equivalent for time ; the community at large are so deeply interested. But there is a limit to speed even in locomotion : we can breakfast in London, and dine in Paris ; but no one would conceive or be satisfied with waiting eleven hours for intelligence from Paris. We can travel to St. Petersburg in six days, but the man would be counted as insane that would be content to receive news from there every six days. One of the clerks at 58, Threadneedle-street, or Lothbury, will tell you at 10·15 the state of the weather at St. Petersburg, Constantinople, or Africa,

at 10 o'clock. The electric telegraph has annihilated time in the transmission of thought and intelligence. Great Britain, the Continent of Europe, of North America, a portion of Asia, Africa, and Australia, are covered with a vast network of telegraph lines. From our insular position, to join us on to the whole, oceans, seas, channels, and rivers had to be bridged, and hence submarine cables became an absolute necessity. By their means we are placed in direct communication with Europe, Asia, and Africa, but between us and the continent of America there is still a great gulf. Steam has done its best; and if the weather holds good, and the machinery does not break down, we have news from America in about ten days; but if we are not content with news eleven hours old from Paris, why should we be with it ten days old from America? If it is important to have a column in our newspapers every morning filled with telegraphic news of what has occurred the evening before in every capital of Europe—if it is important to know whether the “King of Naples” is occupied in packing up his plate, or the “Sultan” changing his Ministers, surely it is ten thousand times more important to a commercial country like ours to have early intelligence from America, with which we have more commercial relations than the whole world besides. Let there be a panic in Paris, Berlin, St. Petersburg, Vienna, or Constantinople, and we are comparatively unconcerned; but let it occur in America, or even in New York alone, and it is as severely felt through the whole of this country as if it had happened in London. So entwined are the two countries in their commercial relations that what affects one must inevitably affect the other. We have a population of 40,000,000 of people to deal with—rivals with us for the trade of the world, all of them sprung from the same race as ourselves—speaking the same language, bone of our bone and flesh of our flesh; and yet we are content to wait ten days for intelligence, and will not wait eleven hours for news from Paris. Why should this thing be? The answer will no doubt be, that the one is a short distance and easy of accomplishment, the



other proved a failure and almost an impossibility :—but this is a mistake ; it is not impossible, or even improbable, but reduced to almost an absolute certainty. That an Atlantic cable has been made, laid, and failed, is quite true ; but if individuals, or a Company, choose to adopt a route totally impracticable, a cable totally unsuitable, and with a route over which it would have been quite as sensible to attempt to build a bridge as lay a cable, and expect it to work for any length of time, and the whole thing totally fail, is it any argument that carrying out an Atlantic Telegraph is an impossibility ? Everything is impossible to some people : steam-navigation seemed so impossible to one learned doctor that he generously offered to swallow the first steamship which should ever cross the Atlantic. Chat Moss and Kilsey Tunnel were both impossible things in their day, but all of them became accomplished facts ; and so will the Atlantic Telegraph if the proper route is adopted ; but if it had to depend on going in a direct continuous line from Ireland to Newfoundland, it would remain a sealed book : fortunately it is not so.

Since writing the above a project has been announced for carrying out a telegraphic line from France to America. The shortest route for such a line will be at the least from 400 to 500 miles longer than the route of the old Atlantic cable ; and, from the few soundings taken, the depth of water is about 3000 fathoms. These features are quite enough as to the *practicability of the route*, and even, if completed, its utility to this country is more than doubtful.

## THE ROUTE FROM VALENTIA TO NEWFOUNDLAND.

---

It is extremely doubtful if a cable could even be laid from Ireland to Newfoundland which would continue working for a month. As to the soundings and nature of the route for a cable from Ireland to Newfoundland, it was thus described by the order of the Directors of the Atlantic Telegraph Company :—

“ The submarine plateau is really a gently-levelled plain, lying just so deep as to be inaccessible to the anchors of ships, and to other sources of surface interference, and yet not so far depressed but that it can be reached by mechanical ingenuity without any very extravagant effort.

“ This steppe is scarcely 12,000 feet beneath the surface of the ocean, and, strange to say, it extends as a continuous ledge 400 miles wide all the way from Cape Race, in Newfoundland, to Cape Clear, in Ireland, between the 48th and 55th parallel of north latitude.

“ This submarine ledge has been very *accurately* examined by soundings, and it is found that it is nowhere deeper than 12,000 feet (a trifle more than 2 miles). It dips down slightly from either coast, reaching its greatest depression in mid-ocean ; but the slope is a very gradual and easy one, and the surface is devoid of all abrupt irregularities.

“ There is no need, then, for much deliberation on the part of man as to the exact position the Atlantic Telegraph is to take ; Nature has beneficently decided this question ; Nature, indeed, has made every preparation for the work. Newfoundland is stretched forth as the hand of the New World to meet the grasp of the British Isles, which are extended as the hand of the Old



World. Exactly where these hands are held towards each other, and between them, a smooth, soft, paved ledge is laid down, to receive the cord that may compensate for the shortness of their reach; and this ledge is placed exactly at the depth which is required for the security of this connecting cord, and just beyond the edge of the eddying current which troubles the centre of the wide sea, the course of telegraphic cable is precisely marked out by natural tracing across the depths of the ocean.

“ There is one line, and only one line, in which the work can be accomplished.

“ Providence has designed that the Old World and the New, severed at first by a great gulf, shall be reconnected by electrical sympathies and bonds, and Providence has prepared the material means for the fulfilment of the design.”

This was the glowing account of the route published especially for the edification of the public, and which it is hardly necessary to say, when the cable came to be laid, was proved perfectly imaginative. The submarine plateau supposed to exist as level as a cricket-ground at the bottom of the Atlantic, had “*been very accurately examined by soundings, and found to be a trifle over two miles in depth.*” So minutely, too, was this survey carried out, that,—“*It dips down slightly from either coast, reaching its greatest depression in mid-ocean; but the slope is a very gradual and easy one, and the surface devoid of all abrupt irregularities.*” But the first attempt to lay the cable in 1857 carried away all these illusory dreams, and the Report of the engineer of the Company quite settled the matter.

The Report states that “at four o’clock on the morning of the 10th the depth of water began to increase rapidly from 550 fathoms to 1750 fathoms in a distance of eight miles. Up to this time 7-cwt. strain sufficed to keep the rate of the cable near enough to that of the ship; but, as the water deepened, the proportionate speed of the cable advanced, and it was necessary to augment the pressure by degrees, until, in the depth of 1700 fathoms, the indi-

cator showed a strain of 15 cwt., while the cable and ship were running  $5\frac{1}{2}$  and 5 knots respectively.

"At noon we had paid out 255 miles of cable, the vessel having made 214 miles from shore. From this period, having reached 2000 fathoms of water, it was necessary to increase the strain to a ton, by which the rate of the cable was maintained in due proportion to that of the ship. Shortly after six the speed of the cable gained considerably upon that of the ship; and up to nine o'clock, while the rate of the latter was about 3 knots by the log, the cable was running out from  $5\frac{1}{2}$  to  $5\frac{3}{4}$  knots per hour. The strain was then raised to 25 cwt., but the wind and sea increasing, and a current at the same time carrying the cable at an angle from the direct line of the ship's course, it was not found sufficient to check the cable, which was at midnight making  $2\frac{1}{2}$  knots above the speed of the ship, and sometimes imperilling the safe uncoiling in the hold. The retarding force was therefore increased at two o'clock to an amount equivalent to 30 cwt.; and then again, in consequence of the speed continuing to be more than it would have been prudent to permit, to 35 cwt. By this the rate of cable was brought to a little short of 5 knots, at which it continued steadily until 3.45, when it parted, the length paid out at that time being 380 statute miles."

This Report completely annihilated the supposed submarine plateau, if it ever existed. Instead of "*a slope gradual and easy, dipping down slightly, and reaching its greatest depression in mid-ocean,*" there was a sudden descent from 500 to 2000 fathoms in a distance of eight miles. If the strain of a ton was sufficient to make the speed of the cable proportionate to the speed of the ship at a depth of 2000 fathoms, what must have been the depth when a strain of 35 cwt. would not suffice to keep even the speed of the cable at double the rate of the ship? So far from being a plateau, the submersion of the cable proved the whole route to be nothing more or less than a series of declivities and ascents; and even within ten miles of Ireland the cable crosses a precipice, where the



water suddenly deepens from 9 to 70 fathoms ; in fact, the whole route, instead of being "really a gently-levelled plain," is more in uniformity with a vast range of hills of more or less height ; and it is as much within the bounds of reason to call it a plateau as it would be to call the "Alps" or "Pyrenees" a "prairie ;" and the greatest credit is due to the indomitable perseverance and energy of Sir Charles Bright and his staff that the old cable was ever successfully submerged at all.

#### SUBMERSION OF THE CABLE.

The Company never supposed or anticipated there would be any difficulty in the submersion of the old cable ; all was to be sunshine. The first attempt in 1857 opened their eyes to the fact, that there were difficulties to overcome of no ordinary character. One end of the cable was landed with vice-regal pomp at Valentia ; prayers were offered, blessings invoked, salutes fired, "and all went merrily as a marriage bell." As the fleet steamed towards the west bulletins were issued every few hours of the progress of the cable ; from shallow to deep water had been passed safely ; the thing was considered done ; serious thoughts were had of saving time by opening Her Majesty's messages to the President ;— 380 miles had been payed out, the cable parted, Atlantic telegraphy for 1857 was at an end, and 50,000*l.* of the Company's capital was swept away in a moment, and the Directors returned to London to raise fresh capital to construct 400 more miles of cable. In 1858 every precaution was taken to choose the best season of the year ; old sea-captains and young sea-captains, horoscopes and almanacks were consulted, and, finally, June was selected as the month, in which nothing but fine weather could possibly occur. The expedition sailed in June : we all know the results. A storm arose which nearly laid the *Agamemnon* and one-half of the Atlantic cable wholesale at the bottom of the Atlantic. After repeated attempts to lay the cable the expedition re-

turned to Queenstown, leaving another 50,000*l.* of the Company's capital at the bottom of the Atlantic. And the expedition sailed the third time, and to the great wonder and surprise of the Directors themselves, succeeded in submerging the cable. The end was landed on the 6th of August at Valentia, and by the 1st of September, 14 days after its submersion, the whole of the Company's capital lay totally useless under the Atlantic. All this may be a commendable thing to repeat, but cannot be very desirable. The risk in the submersion of a cable 2000 miles in one length is something frightful. No manufacturers will take the risk, nor will the Underwriters. The chance of getting eight days of continuous fine weather on the Atlantic is most uncertain, and there is the strong probability, as was the case in the old cable, of paying out 300 or 400 miles, and then finding signals are stopped without any visible reasons, without means of communicating with the other ship to ascertain whether the cable be broken there or at the bottom of the ocean; there is no such thing as stopping. You must either go on paying out, or cut the cable, with the great fact, that the whole cable may be lost in paying out the last 200 miles; whilst during its submersion half a million of money depends entirely upon the man at the break doing his duty. All these risks and a hundred others are so great against the probability of success, that the underwriters decline to take the risk of the submersion of another cable 2000 miles long at any premium. As much as 40 per cent. was paid upon the old cable; another of similar length could not be insured for submersion at 80 per cent.

With our present knowledge a cable 2000 miles long can neither be made perfect nor laid perfect; and the certain consequences of working such a cable would be, that it would not last a month: it is only necessary to look at the construction of submarine cables to see this.

Everything in submarine cables depends on the maintenance of perfect insulation. With wires suspended on poles, and a comparative small loss of insulation, it is good working to telegraph

direct from London to Glasgow, 450 miles, and this, not arising from any difficulty in the length of the wire, but from the fact that in pole-telegraphs a certain number of poles per mile are requisite for the support of the wire. In wet, foggy, or damp weather, each pole becomes to a certain extent a point for loss of insulation; and on the immense number of poles required for a long circuit, as London to Glasgow, the loss in wet or damp weather, though exceedingly small at each pole, still, on the aggregate number of poles, it is very large, and makes working through the line at times exceedingly difficult. Any imperfections in a submarine cable represent, so to say, the loss at a pole on an aggravated scale; and yet there are some persons who talk of getting a perfectly insulated cable 2000 miles long, made, and laid perfect, as the easiest thing imaginable. They certainly can never have had anything to do with submarine cables, or they would not talk such sheer nonsense. They see a mile of copper-wire covered with gutta-percha, or India-rubber, tested; and to all appearances it is as near perfection as possible; and they at once conceive that it is only necessary to have 2000 miles made like that, joined up, and the thing is done, forgetting that "it is the last feather which breaks the camel's back." It does not require a mile, a yard, or even an inch of the core in a submarine cable to be injured for the whole thing to be ruined; only let there be a small hole in any portion of the gutta-percha or India-rubber insulated core of that 2000 mile cable, letting the water outside the cable make contact through that little hole with the copper-wire inside the core, and the whole cable becomes eventually totally useless; and every mile a cable is increased in length, the chances of this are increased an hundredfold, and the ultimate loss so much greater.

Everything is comparative; insulation of wire is no exception. A perfectly-insulated wire cannot be obtained; the thing is not known: all we can do is to take the best that can be got. Insulated wire is now turned out of the manufacturer's with an average loss of from  $2^{\circ}$  to  $3^{\circ}$  per mile. Even that small loss, absolutely



unimportant in a cable of moderate length, becomes of vital consequence where it has to be multiplied by 2000 ; but if it is turned out of the Gutta-percha or Indiarubber Works with a loss of  $2^{\circ}$  or  $3^{\circ}$  (from its liability to injury), it may leave the cable manufacturers in a still less perfect condition. Gutta-percha becomes comparatively soft at a moderate temperature, and the consequence is, that while in a softened state, the copper-wire is liable to be forced from the centre of the gutta-percha. Miles were cut out of the old Atlantic cable, before it was ever put on board ship, with the copper-wire so forced from the centre as to be only covered by a thin skin of gutta-percha, which a scratch of the nail would have exposed ; and how many miles more was shipped and laid in the same condition no one can tell. And how moderate a temperature is required to affect the gutta-percha may be imagined from the fact that, while the Atlantic cable lay coiled at Greenwich, a passing cloud made a difference in the insulation of the cable ; and besides the injuries it receives in this way, the shipment of the cable, the heat generated in the hold of the vessel, and a thousand other causes, all affect the insulation of the wire, and are of the utmost importance where so trifling a defect is required to ruin the whole cable. Besides this, it may be truly said that the *joints* are also the weak points in a cable : copper-wire is only covered with gutta-percha in short lengths, which are then joined up by hand-labour into mile-lengths, and are thus supplied to the cable-manufacturer, and there are necessarily a number of joints, both of the copper wire and gutta-percha, in each mile of insulated core. It is quite true that the mile so joined up is tested under water before leaving the works ; but no strain ever comes on any one of those twenty joints in the copper-wire until the cable is being paid out into the sea. And if any one of those joints in the copper-wire, when a strain comes upon it, be rendered defective, the gutta-percha becomes (when it is too late to repair it) irretrievably injured ; and a cable, unless it is in very shallow water, where

it can be repaired, becomes useless lumber at the bottom of the ocean.

Improvements in the construction of cables will, no doubt, eventually overcome many of these difficulties; but, under any circumstance, every mile a cable is increased beyond the length absolutely necessary is simply adding to the chances of failure. In a cable 2000 miles long there would necessarily be many thousands of these joints, both in copper-wire and gutta-percha, all made by manual labour, which, however expert, and whatever precautions may be taken by the employers, is not always to be depended upon; and it must be remembered that 2000 of these joints have to be made while the cable is being covered with iron strands, and no possibility of being rigidly tested under water.

The natural consequence of this state of things is, that no cables of extraordinary length are ever made, or laid, perfect. What is of comparatively little importance in a cable of 500 miles long, becomes an object of the greatest importance on a 2000 mile cable. The immense amount of resistance to the transmission of signals is such that a cable of that length can only be worked by very powerful currents; the effects of the use of those currents on a defective cable is to burn the most minute holes into larger ones, until the last state of that cable is worse than the first: there is no option; without these currents are employed it is impossible to get a signal through the cable; and if employed, the working of the cable effects its own ruin. And this was the end and beginning, the alpha and omega, of that unfortunate Atlantic cable; for four days after it was submerged an intelligible signal could not be worked through it. After the faults had become oxydized over, either by the action of the salt water or by continuous positive currents, some few messages were transmitted through: but no hieroglyphics or Chinese characters ever took so much deciphering as did the signals through that cable; but the very sending of those signals again stopped the

working. And so it went on, oxydizing over and working; and perhaps, by a little judicious doctoring, might have gone on for a short time longer; but an enormous battery was put on the line—double that which had been used before. “Daniel’s circuit” was visible for a few moments; the small holes must have been rapidly burnt into large ones, and the whole thing came to an end. As a matter of course, any cause but the right one was assigned for the failure; a particular spot was fixed upon, at 240 miles from Valentia, where it was said the cable had become injured on a rock. The fault was a long time in being settled in this place, as it fluctuated (not in the cable, but by the individuals) from 600 miles downwards for a considerable time. At last it was determined so certainly that one individual more learned than the rest foretold, not only the exact number of miles, yards, and inches it was from Valentia, but that exactly one inch of the copper-wire was stripped of the gutta-percha at that spot. Another defect was also supposed to be discovered, under the same *favourable circumstances*, some miles off Newfoundland: 11 miles was determined upon as the particular place; a small vessel was sent to raise this 11 miles, and repair it. Eleven miles of the cable were taken up, but no large fault discovered; it was cut, and the main cable tested again, when, curious enough, the testing again made the fault to be 11 miles from where the cable had been cut. The gentleman in charge of the operation, confounded by this state of things, buoyed up the end of the cable, and came straight home.

It is an absolute fact, that while the cable lay at Keyham, the loss of insulation by the testing ranged *from sixty-five to seventy degrees*, and the cable was not then, nor had it ever been, in water. If it was 70° out of water, it does not require a sage to prove what it would have been in water. The cable proved itself: no sooner was it submerged than for four days no intelligible signal could be worked through it, and it was only afterwards worked for the reasons assigned. It was not that there was a hole in the



Atlantic cable which increased by the working of the cable, but that the whole cable was bad : it was bad when it was laid, and working through it completed the matter. Talk of a particular hole in a particular place in the Atlantic Cable !—it would be as sensible to say there was a hole in a sieve.

And now a “ Don Quixote ” errand has been undertaken to endeavour to repair a cable at Newfoundland when the supposed fault is at the Valentia end of the cable ; and while the Company are spending money on this sort of wild-goose chase, the Magnetic Company are taking down the line erected from Killarney to Valentia, and which, if there was the slightest chance of the cable working, would be kept up, as it is the only means of communicating with the cable over 40 miles of ground. Any attempt to raise the Atlantic Cable, and repair it, will prove just as useful and profitable as the attempt has been to raise the Russian fleet at Sebastopol, and repair it ; it is simply throwing good money away after bad.

#### WORKING OF THE CABLE.

But if in the laying of a cable of 2000 miles there were no difficulties, and a cable could be made, laid, and continue perfect, it would be an impossibility to work it at a remunerative rate of speed at anything like moderate charges. Curiously enough, to a certain extent, the very perfection of the cable itself would increase the difficulties of working through a cable 2000 miles long : this may seem strange, but it is nevertheless true.

If a 16-gauge copper-wire is insulated on earthenware cups, or fixed on poles, you may work through it at any reasonable speed you choose ; but coat that wire with gutta-percha, and place it under water, and the conditions have become changed. If a current be sent through the wire suspended on poles it will pass to earth, in the usual way, at the distant end, and signals will be sent quite as rapidly as the hand can work. For working a telegraphic line, it is essential, however, that the wire should be dis-

charged of one current before a second current is sent, and there lies the great primary difficulty. With submarine wires this is a comparatively slow process. Why does not the wire embedded in the gutta-percha discharge itself as rapidly as the wire on the poles? For this simple reason, that if a powerful current be sent into a 2000-mile cable, the greater portion becomes taken up by charging the inner surface of the gutta-percha. The copper-wire discharges itself instantaneously to earth at the other end, but the gutta-percha discharges itself of the charge it has taken up very slowly, and the consequence is, that when the copper-wire should and would be free, the induced charge taken up by the gutta-percha is flowing back from it and recharging the wire. The transmission, after the working current, of a stream of an opposite polarity neutralises to a certain extent what remains of the former current, but only does it partially; the result is, that the final remainder of the former current flows out from the cable in opposite directions, so that when a second current is sent it meets with the resistance of the return current, and thus is considerably retarded; and to such an extent is this retardation in a 2000-mile cable experienced, that if ten consecutive currents of the same polarity were sent into the Atlantic cable, only one elongated signal would be recorded at the other end, one current overtaking the other like waves on a beach; and so long a period is this retention of charge in 2000 miles of insulated wire, that it was quite possible to get a discharge from the Atlantic cable twenty-four hours after a current had been transmitted through it; the whole, in fact, being nothing more or less than one immense Leyden jar.

Or, in other words, the copper easy, the gutta-percha difficult of polarization. The more easy of polarization a substance is, the better a conductor it becomes; the more difficult of polarization, the better insulator: in fact, perfection in insulation means a perfect resistance to polarization, and the more difficult a matter is of polarization, with so much more difficulty does it give

up its polarity. If gutta-percha was incapable of polarization, or any other substance could be obtained possessing such a qualification, three-fourths of the difficulties in working submarine cables would be at an end. The first currents sent through a cable go with great rapidity, the copper-wire becoming polarized, and depolarized instantaneously ; it is not until several signals have passed that the inner surface of the gutta-percha, being more difficult of polarization in the first instance than the copper-wire, becomes polarized. The gutta-percha, retaining its polarization much longer than the wire, keeps the conductor polarized. When it is an absolute necessity that the wire should be free for another signal, the transmission of a current of an opposite polarity only partially neutralises this state of things, and the effects are as before stated. A cable of 2000 miles has with such accumulating force this induced charge, that a current generated by the most powerful battery from the largest induction coil ever constructed, sent into one end of the Atlantic cable while lying at Keyham, was a second and a half before it showed the slightest indications at the other end. A great difficulty in dealing with these induced currents arises from the fact that in working the Morse alphabet, dots and dashes, the currents are not of equal duration and length, and therefore it becomes necessary to invent some compensation for it. The only mode in which it will ever be possible to work long cables advantageously will be by the adoption of a system in which currents of an equal length will be used and equal compensating currents provided.

Another great evil in working one continuous cable 2000 miles in length from Ireland to Newfoundland is the "earth's currents." Every cable crossing the meridian in a direct line is considerably more liable to these than if taking an oblique direction. The effect on the Atlantic cable is something wonderful, and when a magnetic storm is passing over the surface of the earth, all intelligible working of the Atlantic cable is quite futile ; and so powerful are these currents at ordinary times, that it is extremely difficult to distinguish



between "electrical currents" and "earth currents;" and even since the Atlantic cable has failed and been abandoned, it is almost impossible to sit opposite a galvanometer connected to the Valentia end of the cable and notice the quick violent oscillation of the needle from one side of the galvanometer to the other, and not believe but that you are receiving a message at a very rapid speed from Newfoundland. From numerous observations made, both when the cable was working the little it did work and since its failure, it is impossible to doubt but that there would have been many hours each day, probably a day or two at a time, and this occurring frequently, in which, even had the cable kept working, it would have been impossible to do more than watch the play of the "earth currents." These are but a few of the difficulties in the way of working a cable 2000 miles from Valentia to Newfoundland; and, strange enough, whatever improvements may be introduced to lessen any one of these difficulties, such improvement in lessening one, increases another, or creates a fresh difficulty. If a cable went down defective, as it most assuredly would do if ever it was laid at all (not a very certain thing), it could not be worked through and last a month. If it be supposed possible to make and lay the cable perfect, and it continue perfect after laid, even then no amount of ingenuity, however well devised, would ever get such a rate of speed through it that at the end of twelve months, taking all the messages sent through the cable and *paid for*, it would be found to have sent on an average one word per minute. It is quite true there are some sanguine individuals who talk of getting five, ten, or even twelve words per minute out of a new cable: but this is the merest theory, and quite opposed to all practical experience; persons making such statements can have but little knowledge of the actual working of the old cable, or even of ordinary submarine cables, to state unattainable results, or they are wilfully deceiving the public. The first is certainly the most charitable construction.

The reduction of speed in working through submarine cables by

no means follows as their length : beyond a certain length the speed decreases in greater ratio than their length increases : this is an established fact, proved over and over again. Professor Hughes, amongst others, tried this on the Red Sea cable while it lay at Birkenhead. Through 500 miles he got 20 words, at 1000 miles he got only 8 words, and through 1700 miles 4 words per minute : this too was through good cable, not yet left the manufacturer ; so that if 20 words can be obtained through 500 miles, it does not by any means follow that even three words can be worked through 2000 miles. But these are only the results obtained on a trial ; the working results would be widely different. If three words could be worked on a cable 2000 miles long before submersion, or even after submersion on a trial, allowing for delays, interruptions, and continually repeating, to secure accurate transmission (nearly every word would require repeating), the speed would not average more than, if so much as, one word per minute. On a 500 mile circuit, with 200 per cent. less delays and interruptions than on the 2000 mile cable, although 20 words could be obtained through it, it would not average a working speed of more than from 12 to 14 words per minute.

It is asserted that a new cable 2000 miles long can be so constructed as to obtain five words per minute through it. I do not doubt it. It is an admitted fact that as much as three words were obtained through the old Atlantic cable, after submersion for a few minutes together ; but the question is not what may on experiment be obtained through the cable, but what is the real speed at which messages will be transmitted and paid for. No matter how perfectly a cable is made—2000 miles long,—if a calculation be made of the amount in money which one word per minute comes to, and take a year's income of that cable at that rate and compare the two amounts, it will be found that the income did not reach within several thousand pounds of the total amount which would have been realized had one word a minute been worked and paid for. Those who assert that five words per minute can be obtained through 2000

miles, simply in the same breath declare that a cable 500 miles can be worked at five or six times the speed; and therefore their arguments are against the advisability of adopting a long circuit, and strongly in favour of short ones.

No doubt it will be said that one word per minute is a small speed to allow for a 2000-mile cable from Valentia to St. John's; but I am convinced it will prove quite up to, if not above, the average speed obtained and paid for (no matter what cable is laid on that route); if the working of the old cable is any guide, a new cable would not work one word in two minutes, let alone one word in one minute. At the very time the Atlantic cable was supposed to be working so splendidly, it took *twenty hours* to transmit her Majesty's Message through the cable—not four words per hour. It was begun at five o'clock one morning and finished at seven o'clock the next morning. Six hours of this time was taken up in operations to repair the cable at Valentia; 180 yards of Morse-paper were consumed to record this message intelligibly at Newfoundland, the signals received there being of the most confused description. A gentleman sent down by the Directors to examine and report on the working of the cable tried it for his own satisfaction no later than the 18th of August, and he obtained a speed of *ten words in nine hours*. The writer witnessed the working of the cable from the transmission of the Queen's Message up to the receipt of the President's reply, and the speed obtained was not ten intelligible words per hour, to say nothing of one word per minute; in fact, the greatest praise is due to the telegraph clerks who were at Valentia for their laborious patience, otherwise there would never have been a single word obtained through the cable. The manner in which they extricated a word out of a confused jumble of "electrical currents" and "earth currents" was something wonderful; and so much was this, that it was not safe to retain a single word in a message until it had been repeated over and over again as correct. Those parties who talk so glibly about five or ten words per minute as the average



working speed on a future Atlantic cable 2000 miles in length can most assuredly have never witnessed the working of the old cable. If one word, or ten words at the best, per hour, was the working speed of the old cable, it is going a long way to give a new cable one word per minute. These are simply facts as to the working of the old cable—facts undeniable—and with the knowledge that no intelligible signals had been received through the cable for four days after submersion; with the receipt every day of telegrams from the electricians to the effect that the cable was bad, that signals were getting worse, and that if something was not done, communication would soon entirely cease: at this time the Secretary, on the 18th of August, 1857, wrote the following letter to the editor of ‘The Times:’\*—

“SIR,—I have the pleasure to inform you that the line from Valentia to St. John is NOW WORKING SATISFACTORILY BOTH WAYS. The following message was dispatched yesterday evening from the Directors in London to the Directors in America.

“This message, including the addresses of the senders and receivers occupied 35 minutes in transmission, and consisted of 31 words. Afterwards, a message from her Majesty the Queen to the President of the United States, consisting of 99 words, was received by Newfoundland in SIXTY-SEVEN MINUTES. Both messages were repeated back to Valentia to test their accuracy, and were found to have been taken with the GREATEST EXACTNESS. This morning we have received the following message from Mr. Cyrus Field, who is now in Newfoundland, the last 28 words of which were read in 22 minutes.

“It will be seen that the line is now capable of being worked with perfect accuracy, and the Company will now proceed as rapidly as is consistent with the establishment of a proper system, to make the necessary arrangements for opening the communication to the public, in doing which some necessary delay must occur.”

---

\* It is not intended here to impute to the Secretary of the Company—a gentleman widely respected, and whose personal candour is well known and recognised—any intention to mislead the public: being himself 600 miles from Valentia, he could merely communicate what he received from there as to the working of the cable.

This needs no comment. And so the cable flickered on ; now working, now stopped, until, on the morning of the 1st of September, it seemed resuscitated for a few hours, and the last message sent through the cable was to Mr. Cyrus Field.

“The Directors on their way to Valentia to open cable to the public.”

And so the cable became dead. It need not be added that the cable was not opened to the public, nor ever will be. But now other statements are put forth in various quarters that a number of experiments recently made will prove indisputably that a cable 2000 miles long can be worked at a good speed without any hindrance, and that experiments have been made showing that there will be no difficulty in the construction of a deep-sea cable, and that the submersion of it is a matter of the greatest feasibility ; in fact, that all the preventitive causes in the way of working or submerging a two-thousand mile cable have been overcome. Will it be believed that the whole of the Government experiments, which are to solve the problem of working a two-thousand mile cable, have been made on no greater than a mile-length of insulated wire ? Will it be believed that the whole of the Government experiments, which are to determine the most suitable cable for deep seas, and more especially for the Atlantic, consist in suspending to three shear legs, about twenty yards of different descriptions of cable, and attaching weights to them until they break ? It may seem incredible, but it is nevertheless true ; and because some six months have been consumed carrying out experiments on single miles of insulated wire, and a number of specimens of cable broken, we are asked to believe that the immense obstacles of working long cables have been overcome, and cables themselves arrived at perfection ; and the public are to be asked to subscribe further money for a second cable on the old route on the faith of these experiments.

## THE NORTHERN ATLANTIC LINE

VIA

FAROE ISLANDS, ICELAND, GREENLAND,  
AND LABRADOR.

---

IF the shortest route to America, and the only route, were by having a cable 2000 miles in one continuous length from Ireland to Newfoundland, we might well despair of ever permanently establishing telegraphic communications with America; but this is not so. It is one of the axioms of submarine telegraphy for long circuits never to carry a cable in one continuous length, where it can be divided into sections. There are no two opinions on this point, nor has there ever been the slightest difference amongst telegraph-engineers on this question: where this law has been disregarded the result has, without exception, been failure. Neither is there any difference of opinion as to the fact that if an Atlantic Telegraph can be divided into three or four sections it would be immensely preferable, reduce greatly the risk of the submersion of the cable, diminish seven-eighths of the risks of the maintenance of the cables in good working order, and be worked through at twelve times the speed of one submerged to America in one continuous length. When a cable can be carried from Scotland to the Faroe Islands, thence to Iceland, from Iceland to Greenland, and thence to Labrador, the engineer who would attempt in the face of this to carry a cable direct from Scotland to Labrador, would be counted a lunatic, and deservedly so. This was exemplified in the Red Sea Cable. The first section, from Suez to Corsair—380 miles—was laid and worked successfully; the second section, from Corsair to Suaken—460 miles—was also laid and worked successfully; but the third section, which it had been intended to divide into two parts, was carried on in a direct line to Suez: the consequence is that the third section—750 miles—has



failed, and, curiously enough, the fault is supposed to be about half-way between Suaken and Suez, and the whole line of telegraphic communication to India is blocked up because those entrusted with the submersion of the cable disregarded one of the ordinary laws of submarine telegraphs. And this case is no exception. Any attempt to lay a cable across the Atlantic in one continuous length will always as surely result in a failure as would an attempt to rebuild Westminster Bridge with a single span from one side to the other, instead of a number of arches and abutments. But if all these reasons are so plain, it may be fairly asked, Why was not the Northern Route adopted in the first instance, instead of throwing away half a million of money on a route totally impracticable?

#### NEWFOUNDLAND MONOPOLY.

There is a company of American gentlemen called the New York, Newfoundland, and London Telegraph Company. These gentlemen have the whole of the telegraph lines in Newfoundland in their own hands, also the lines leading to Canada and the United States; and they also hold the exclusive concession of landing cables on the coast of Newfoundland. One of the principal Directors of that Company—Mr. Cyrus Field—came over to this country for the special purpose of forming a Company to carry a cable from Ireland to Newfoundland. He succeeded in this object, a Company was formed, and for the permission to land cables in Newfoundland the Company had to pay 75,000*l.* in shares. Messrs. Field and Co. were wise in their generation, for while a British Company had to pay 75,000*l.* for permission to land cables on British territory, they, with a vast deal of foresight, provided that if ever the cable should remain twelve months without working, the concession lapsed back again. And much to the astonishment of the shareholders, who had fondly imagined all along that the concession was the sole exclusive property of the Company—something tangible in case the cable failed, the concession did lapse back to Messrs. Cyrus Field and party: but the shares did

not go back to the Company, so that the direct object these parties had was to carry a cable to Newfoundland, without reference to the route, whether bad or good. Well, they had their day. The public nobly came forward and subscribed even more money than was required; they got the cable made. After repeated attempts and considerable loss of money they got it laid, and within one month afterwards the whole thing was a total ruinous failure. But this was not enough. Without the slightest inquiries being instituted by the Company themselves (no one expected Mr. Field to make any inquiries) as to whether the route had anything to do with the first failure or not, they at once propose to make another cable, and lay it on the same route. The subscribed capital in New York barely paid the advertising. And Mr. Field again came over to this country with the concessions, willing a second time to place them at the service of the British public, and, on certain conditions, generously to allow the British Company to land cables on their own territory. He only understood an Atlantic Telegraph so far as it brought one end of the cable into the lines of his own Company at Newfoundland, where every message through the cable must of necessity pass over their lines, and so place it out of the power of the Government or private individuals to send a single message to Canada without those messages going through the hands of an American Company. What security that an important message for the Governor-General of Canada should not be known at the same time at Washington? But the attempt to raise money for a second cable was as great a failure as the old cable itself. And thus has been thrown back for four years the completion of an Atlantic Telegraph; and the question has really come to this, Are we really to have an Atlantic Telegraph or not?

#### PRACTICABILITY OF THE NORTHERN ROUTE.

The utility and practicability of establishing transatlantic telegraphic communications with America are unquestionable; there is only one route on which the submersion, maintenance, and good

working are at all feasible ; and that is the *Northern Route*. The total length is not greater than that from Valentia to St. John's, and yet it will be divided into four sections :—

				Miles.
Scotland to the Farøe Islands	..	..	..	225
Farøe Islands to Iceland	..	..	..	300
Iceland to Greenland	..	..	..	600
Greenland to Labrador	..	..	..	600
Total	..	..	..	1725

where it is joined on to the lines to Canada, and so on to New York ; messages for Canada going direct to Canada, messages for the United States going direct to the United States, without the slightest fear of supervision on either side. There is not the slightest difficulty in the completion of this route. The Emperor of the French is about laying a cable from Toulon to Algiers : has any one declared it impossible for this to be carried out ? Certainly not. It is looked upon as an ordinary every-day occurrence, and a contract was taken to complete the line and maintain it in working order for four years, and yet the route is quite as long, the water quite as deep, and the bottom considerably more dangerous for the existence of a submarine cable than the worst of the sections to America. Even the greatest objectors to the Northern Route freely admit that there will be no difficulty in completing the line and successfully submerging the cable (in fact, there would be no difficulty in getting a cable-manufacturer to make and lay the cable at his own risk) ; but the objections are that the line, when completed, is liable to injuries from icebergs, and that is the only point at issue. The value of an opinion depends very much on the practical knowledge the individual has who proffers it. If Sir Edward Belcher, Captain Osborn, Sir Leopold McClintock, Captain Robinson, and numerous other eminent Arctic navigators who have spent the best portion of their lives in that part of the world where it is proposed to lay this cable, were asked what would be the best-sized conductor and insulator for the core of a cable for one of those sections, or what would be the best instruments to work the cables after they were laid, they



might possibly give an opinion, but their opinion would be valueless because they can have no practical knowledge of the subject on which they would be giving an opinion. But ask these gentlemen whether any danger would be likely to arise to a cable from icebergs, from Iceland to Greenland or from Greenland to Labrador, and their opinion becomes of immense value, because they are speaking of a subject wholly their own. And this is just the case in reference to the Northern Route. All the most experienced navigators, gentlemen of the highest station and ability, who know the proposed track for this cable quite as well as they know Cheapside, declare it is quite feasible, and no danger need be apprehended from icebergs. And yet, on the other hand, individuals will be found who have never been twenty miles from the shores of England in their lifetime who talk as confidently of icebergs as if they had been in the habit of dining on one every day for weeks together. They seem to have some sort of indefinite notion that icebergs must come floating down from the North; and that they all at once stop in their course at the south of Greenland and Labrador (of course just where the cable would be laid), and perform a sort of quadrille before getting down to Newfoundland.

The real truth is that without doubt the most dangerous place for icebergs to a submarine cable is off Newfoundland; and during the submersion the log of the 'Niagara' and Mr. Field's Diary record icebergs passed within fifty miles of Newfoundland and in shallow water:—

FIELD'S *Diary*.—"64 miles from Telegraph Station. During this afternoon and evening passed several icebergs. Informed the *Agamemnon* that the *Niagara* was in 200 fathoms of water."

"—— passed this morning several icebergs. Made land off the entrance to Trinity Bay at 8 A.M."

In addition to this, at the formation of the Atlantic Telegraph Company it was distinctly stated that the Newfoundland end of the cable would be carried up the Bay of Bull's Arm, to be protected from the icebergs; and now that the cable is dead, so precious

does it seem in their eyes, that they are again removing the Newfoundland end of the cable, and carrying it up another bay, as the present position is still dangerous from icebergs. Surely those who live in glass houses ought to be careful how they throw stones !

The reasons for the opposition to the Northern Route are obvious, but it will never succeed in blinding the public as to the impossibility of the old Atlantic route, or in preventing another route from being followed.

The real truth is, that the danger likely to arise from icebergs to a cable laid on the Northern Route is nothing more or less than a bugbear conjured up only by interested imaginations. Icebergs between Scotland and Iceland are as much novelties as they would be off Spithead. Nobody ever saw an iceberg in these parts, and the chances are that no one ever will. Icebergs are only dangerous in shallow water. The depth of water between Iceland and Greenland is about 1000 to 1500 fathoms, with a bottom of deep mud and sand : there are numerous bays on the east and west coasts of Greenland, where they penetrate into the interior ten, twenty, or thirty miles ; some of them never freeze, nor does the ice go up them but a few miles. They are very deep, and the icebergs never ground there, and the bottoms of these bays are stated to consist of mud and sand, and the Arctic current does not approach the coast on either side. As it is not supposed that any injury could arise to the cable in deep water, but only at the shore-ends, if these landing-places be carefully selected, a cable will be more safe than if it lay in a frequented sea, where the cables are continually in danger from vessels' anchors. From Greenland to Labrador the water is of ample depth to prevent the shadow of possibility of injury to the cable from icebergs ; and as to the coast of Labrador, Hamilton's Inlet affords all the desired advantages. This inlet runs into the interior 140 miles, and at its mouth is not less than 30 miles in width ; the water is deep and the bottom is sand. At the mouth of the inlet there is a deep trench to sea, and a cable laid there could never be disturbed. Above and below the Inlet there are shoals and reefs some 30 miles from the

coast, and many icebergs ground on them. After they melt and break away to pieces they pass over and beyond the mouth of the inlet, but never ground at the mouth, nor do they enter the mouth of the inlet; and perhaps it is a most lucky thing for the Atlantic Telegraph Company, and their future cable (which, however, as yet, exists only in their own imagination), that these shoals and reefs do exist to intercept some of the icebergs on their course, as the icebergs go south in great quantities until checked by the eddy currents off Newfoundland. Many of them enter the bays of Newfoundland, and a cable is far more liable to injuries from them there than off either the coast of Labrador or Greenland. The Northern Route is composed of four sections; it is a matter beyond dispute that on three of these sections there are no icebergs whatever; and on the fourth section, the only possible danger is in shallow water at the landing-place of the cable. A careful, judicious selection, and good stout shore-ends to the cable will place this also beyond danger. No injury need be apprehended to the cable on this route from the great enemies of all submarine cables, the Captains of vessels, who seem to have some loose ideas, that all submarine cables are especially submerged for them to anchor to. The *Agamemnon* herself, after landing the end of the cable at Valentia, anchored over it, and put three kinks in it, and within two days afterwards a little sloop anchored in Valentia Bay, on to the cable, and damaged it. All these dangers are avoided on the Northern Route, and the shore-ends of the cable will be considerably more free from anchors than a cable at Newfoundland will be from icebergs.

#### THE TWO ROUTES COMMERCIALLY.

But while the route is perfectly feasible, and the submersion of the cable offers little or no risk, whilst its maintenance is almost reduced to an absolute certainty, there are other considerations quite as important as these: supposing the line be completed and working, will it pay a good dividend to those who invest their money in it? because if it will not, however useful and beneficial it may

be to the community at large, it can hardly be expected that the public will subscribe their money to carry out an undertaking which will not return them a good rate of interest for their investment. It might very truly be said, "Oh, complete the line, and it must pay well; it is one of those things in which there would be no competition, and it would be only necessary to increase the charges to any amount until it did pay." But this is a wrong view of the matter; high prices, whether in telegraphy or otherwise are quite a mistake; the real question is this:—Supposing a line completed, can messages be sent for the public at such moderate charges as to make an Atlantic Telegraph not only for the use of the Government and a few wealthy individuals, but bring it within the daily use of the vast commercial classes of this country, and thus enable it to pay its proprietors a good dividend, and leave a reserve fund for all contingencies that might arise?

Perhaps the Irishman's mode of answering one question by asking another, is about the best in this case. Supposing the old Atlantic cable had continued working, or that a new one were constructed with all the improvements that could be secured, and laid from Valentia to St. John's, and continued working, would it pay a fair dividend on the outlay at the proposed charges, 2s. 6d. per word, because if it would pay 5 per cent., it may very fairly be assumed a cable *via* the Northern Route would pay 60 per cent.

On the sections of the Northern Route, although twenty words might be obtained through on a trial, the cable would not average a working speed of more than twelve words per minute. This would allow a large margin for all interruptions and repeats. From Ireland to Newfoundland the speed would not exceed one word per minute, allowing six hours per day for repeats, delays, and interruptions. The rate at which messages are sent now will be greatly increased by a system of abbreviation of words, which would, at the least, double the rate of transmission where all the messages are merely a repetition of the same words differently strung together. The saving of time in abbreviating all these words on a submarine cable would be immense; so that, supposing



the two routes completed from Ireland to Newfoundland, and viâ the Northern Route, the different receipts would, at the end of twelve months, average as follows :—

## ATLANTIC TELEGRAPH CABLE.

Words.

1 per minute.

60 per hour.

18 hours.

---

1080 per day.

7 days.

---

7560

52 weeks.

---

393,120 words per year.

393,120 words per year, at their own tariff, 2s. 6d. per word, would amount to 49,140l.

5 per cent. dividend on the £.

cost of new cable .. .. 500,000

---

25,000

Working expenses .. .. 15,000

---

£40,000

7 per cent. would swallow up the whole, but leaving 90000l. to go to a reserve fund, or, in other words, 5 per cent. for a risk that underwriters will not undertake even the submersion of at any premium, and a reserve fund, which it would require steadily kept up, and then take 55 years to accumulate enough for another cable; and even the whole is entirely dependent on the cable remaining in perfect working order, and the working *actually paid for* not averaging less than one word per minute, and is likewise dependent on the remote supposition that the public will go and pay them half-a-crown for a word they can get the very next door for one shilling.

## NORTH ATLANTIC TELEGRAPH.

Words.

12 per minute.

720 per hour.

24 hours.

---

17,280 per day.

7 days.

---

120,960

52 weeks.

---

6,289,920 words per year.

6,289,920 words per annum, at the Atlantic Telegraph Company's proposed tariff, 2s. 6d. per word, would amount to 786,240l.; or, at 1s. per word, would amount to 314,496l.

20 per cent. on cost of completion of route in good working order .. .. 100,000

Working expenses .. .. 25,000

---

£125,000

£.

Income .. 314,496

Expenditure 125,000

---

£189,496 for reserve fund.

or<sup>amply</sup> sufficient to lay a new cable from Labrador to Greenland, or from Greenland to Iceland, every year.

This is no exaggeration, but simply plain facts. If twelve words per minute can be worked easily through 500 miles of cable, all the rest follows as a matter of course. Something has been said that still, although twelve or fifteen words can be readily worked through one section, there are three or four sections to repeat it, and so it occupies as much time as through the 2000-mile cable ; but those who make such foolish statements as these can only do so from entire ignorance of submarine telegraphs. Does any one suppose that if a message is sent from the home station direct to Iceland—say of twenty words—that, having sent that message at the rate of twelve or fifteen words per minute to Iceland, the clerk will sit, with his hands in his pockets, whistling, until “Iceland” has sent it on to “Greenland,” and “Greenland” on to “Labrador?” It is a gross absurdity to say so. Suppose the whole line ready for business : the operators at Labrador, Greenland, Iceland, Farøe Islands, and Scotland, all ready at their posts. Scotland commences sending a message ; Farøe Islands takes it ; sends it on again ; and so it is taken up and sent on along the whole line to America. And, in fact, everything depends on the clerk at Scotland keeping up a constant transmission of messages to keep the whole line employed. All it requires is Scotland to commence a few minutes before Greenland, and all the stations would be kept busily employed. This objection is so thoroughly impracticable that, were it not for the extreme air of plausibility it carries on the face of it, and its being apt to deceive casual readers, it is hardly worth notice.

It will be seen from this statement, that if the Atlantic Telegraph Company could either restore their present cable, or find any one sufficiently patriotic to throw another half-million of money away after it, and that cable should be so fortunate as not only to be laid but to continue working, they could not afford to send messages at less than 2s. 6d. per word, and even at those excessive charges could not pay more than 5 per cent. and defray working expenses ; and they would require twelve or fifteen cables

to give as much accommodation to the public as the Northern Route.

On the other hand, a cable by the Northern Route could transmit messages at 1s. per word, or 150 per cent. less than the Atlantic Telegraph Company. It would offer twelve times more accommodation to the public, and to its proprietors it would pay a most handsome dividend, provide for all working charges, and leave a reserve-fund to provide for the repair or the renewal of any section, should it fail. The reserve-fund itself would replace one section every year. A cable laid containing two or three wires would double the receipts without increasing more than one-third the original expenditure or increasing considerably the working expenses.

Strange things do occur at times, and it is just possible there may be another half-million of money spent on the long route; if so, those who subscribe it would save themselves a vast deal of anxiety if they were to give their money at once to the captain of one of the American mail-steamers to attach to a 64-lb. shot on his next voyage, and throw it overboard half-way across the Atlantic. The only difference between doing this and making a cable with it is that the one occupies longer time than the other, but the termination would be found exactly the same.

#### CONSTRUCTION OF TELEGRAPH CABLES.

If ever a cable is to be carried to America and continue working, it must be in sections, and these sections are only to be obtained on the Northern Route, and a good cable is an absolute necessity: every care and precaution ought to be taken in adopting it. Cheap cables, like everything else cheap, are very dear in the end, and submarine cables are of those things which, if not well done at the outset, had better never be done at all. Upwards of a million of money has been recklessly thrown away on submarine cables, because cheapness has been the object and not a good

permanent line of telegraph. But where permanency has been sought, and proper, careful consideration has been given, excellent results have been secured. The cables laid by the Submarine Telegraph Company may be instanced, which have been submerged for years and are still in good working condition. The Calais cable, laid in 1851, is working as perfectly as ever; the Hanover cable, 280 miles long, through which 22 words per minute has been worked, is also working successfully. The same Company have another cable of nearly 400 miles in length to Denmark, and more nearly approaching the sections of the Northern Route, where direct circuits of 700 miles are every day worked at a remunerative speed and the Company can pay a dividend of 7 or 8 per cent.; and there is no earthly reason why the cables of other Companies should not be in the same healthy condition. Why they are not so is a matter for the Directors of the Companies themselves. By whomsoever the Northern Route is carried out, the best insulation and the best form of cable which, to use a vulgar expression, can be got for "love or money" should be selected. It ought to have a moderate-sized conductor, the best insulation, and plenty of it. A small amount of insulation is the old story of "sinking the ship for a pennyworth of tar."

It would extend this pamphlet too far to go in detail on these matters, and would be much out of place, as the writer has reason to know that, should the route be carried out by the proposed North Atlantic Telegraph Company, the electrical department will be in the hands of a gentleman as widely renowned for his deep scientific research, as his immense practical knowledge on these matters—a gentleman who never undertook to do anything he did not do well—and whose name will be quite sufficient to assure the public as it will do those connected with the telegraph—that anything it is possible to do to make this line a good working permanent line of telegraph will be carried out.

Having obtained the best-sized conductor and the best insula-



tion, the next thing is to cover the core with such an outside covering that no strain whatever will come on the core ; that while it protects the core it shall not injure it ; that it shall not untwist during submersion, or be liable to “ kink,” which has ruined more cables than anything else. Cables up to the present time have been made like an ordinary rope, and this form of cable will “ kink,” in spite of all precautions, and will untwist during submersion. From the time of the Atlantic cable leaving the last sheave of the paying-out machinery until it reached the water, it revolved no less *than twenty-five times* ; and so with every cable made in that form some strain must come on the core ; any sailor-boy will tell you that in a rope made with an ordinary twist the first strain comes on the heart of the rope.

And so in a cable ; the outside wires being laid spiral and the core straight, a strain comes on the core ; it is inevitable ; and straining the core of a cable simply means ruining it. The perfection of a submarine cable consists in no strain whatever coming on the core ; and in spite of this “ kinking,” “ untwisting,” and injury to the core, ruining its insulation, some persons are still so incredulous as to hold up their hands in astonishment when they hear of the failure of a submarine cable. The wonder is not that they fail, but that, with the small amount of insulation put on them and the manner in which they are constructed, they ever work at all ; and the new method adopted of covering the iron strands with hemp is equally futile and useless. The only reason assigned for it is a little more strength gained ; but it is not a little more strength that is wanted : if a cable is payed out in a proper manner, there is no more difficulty or danger of breaking a cable only carrying a strain of a ton than there would be with a cable carrying eight tons strain ; in fact, considerably less danger with the one ton than with the eight tons ; for whatever is added to a cable to increase its bearing-strain must at the same time proportionately increase its weight ; but this iron and hemp cable laid up like an ordinary rope, does not remove a single one of the

evils at present existing in the outside construction of submarine cables. On the other hand, I very much doubt if they are not increased ; it does not afford any mitigation of the existing evil—the strain on the core, while it will both kink and untwist more than the old iron-stranded cable. It is asking for bread and getting a stone.\*

This was the form adopted by the Government for the Gibraltar cable, and they have so little confidence either in the *selection* or the *selectors*, that, having spent an enormous sum on this cable, they are afraid to attempt its submersion on the route for which it was chosen, and are now, with this cable in the same position as the old lady who won the elephant in the raffle—having got it, the difficulty is what to do with it.

Those who carry out the Northern Route would do well to bear this in mind—it is no matter how good a conductor or insulation is obtained, if an outside covering is adopted, on the principle of twisted rope, either composed of iron, or hemp and iron, it is risking the chances of success. What is required for these deep-sea lines is a good light cable, heavy enough to lie at 2000 fathoms deep, yet light enough to make underrunning it and repairing it, if necessary, a matter of no difficulty ; with the outside covering so formed that it cannot twist or untwist, cannot “ kink,” and allows no strain to come on the core. This, with the addition of good stout iron shore-ends up to deep water, and good landing-places selected, and the Line of the North Atlantic Telegraph will be the most secure, the most permanent, and best-working line in the world. There are cables so constructed, embodying all the necessary conditions to secure success, beyond the slightest chance of failure ; and if there were not it would be a libel on the intelligence and genius of the country to say that, having discovered what the defects in the present cables are, they cannot be remedied. Too much in the selection of cables has hitherto been left to the manufacturers,

\* A great improvement on this form of cable would be having two layers of iron strands covered with hemp laid spirally on the core in reverse directions.

who, having a certain class of machinery erected, are disinclined to throw that on one side for machinery of different descriptions. Too much looseness on the part of some of the Companies—who, so long as they could get a contract taken, to make the line, and get it laid at the risk of the contractor, never took the slightest trouble to ascertain whether the cable was at all suitable, or likely to remain a permanent line; this has had for its consequence that more lines have proved temporary than permanent.

### CONCLUSION.

This hurriedly-written pamphlet has already far exceeded the length intended, but the whole subject is so vast that the difficulty is where to leave off. It has not been written for scientific criticism, but from an honest desire to see an Atlantic Telegraph carried out, and not more money and good time wasted on a route totally impracticable both engineeringly and electrically.

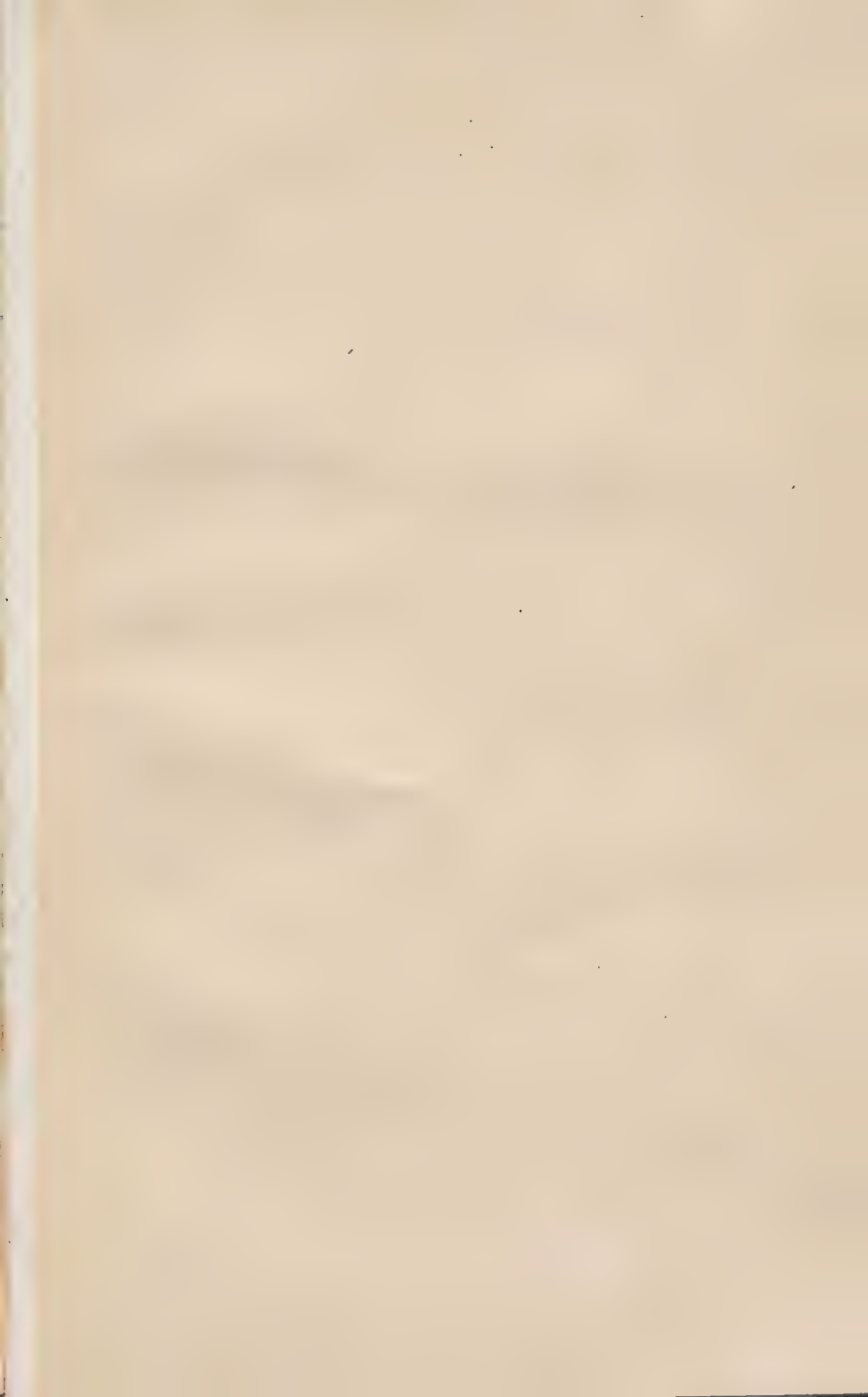
The Government, impressed with the vast importance of the completion of an Atlantic Telegraph, and advised by a whole host of eminent Arctic navigators that the supposed dangers to be apprehended from icebergs are nothing but the foolish reports of ignorant persons, or that they proceed from interested imaginations, and being advised by the most eminent telegraph engineers, that electrically speaking, it is immensely preferable to any other route, have commissioned the *Bulldog*, and appointed Sir Leopold M'Clintock to the command, for the purpose of proceeding to take the deep-sea soundings for the route.

And the little *Fox* is again about to plough the way to the Arctic Regions, under the command of Captain Young, and carrying Colonel Shaffener and a body of experienced engineers to examine minutely the whole route, select the landing-places and make the necessary surveys for the land lines.

That an Atlantic Telegraph will be completed, is as sure as the sun will shine to-morrow. We shall soon look for telegrams from

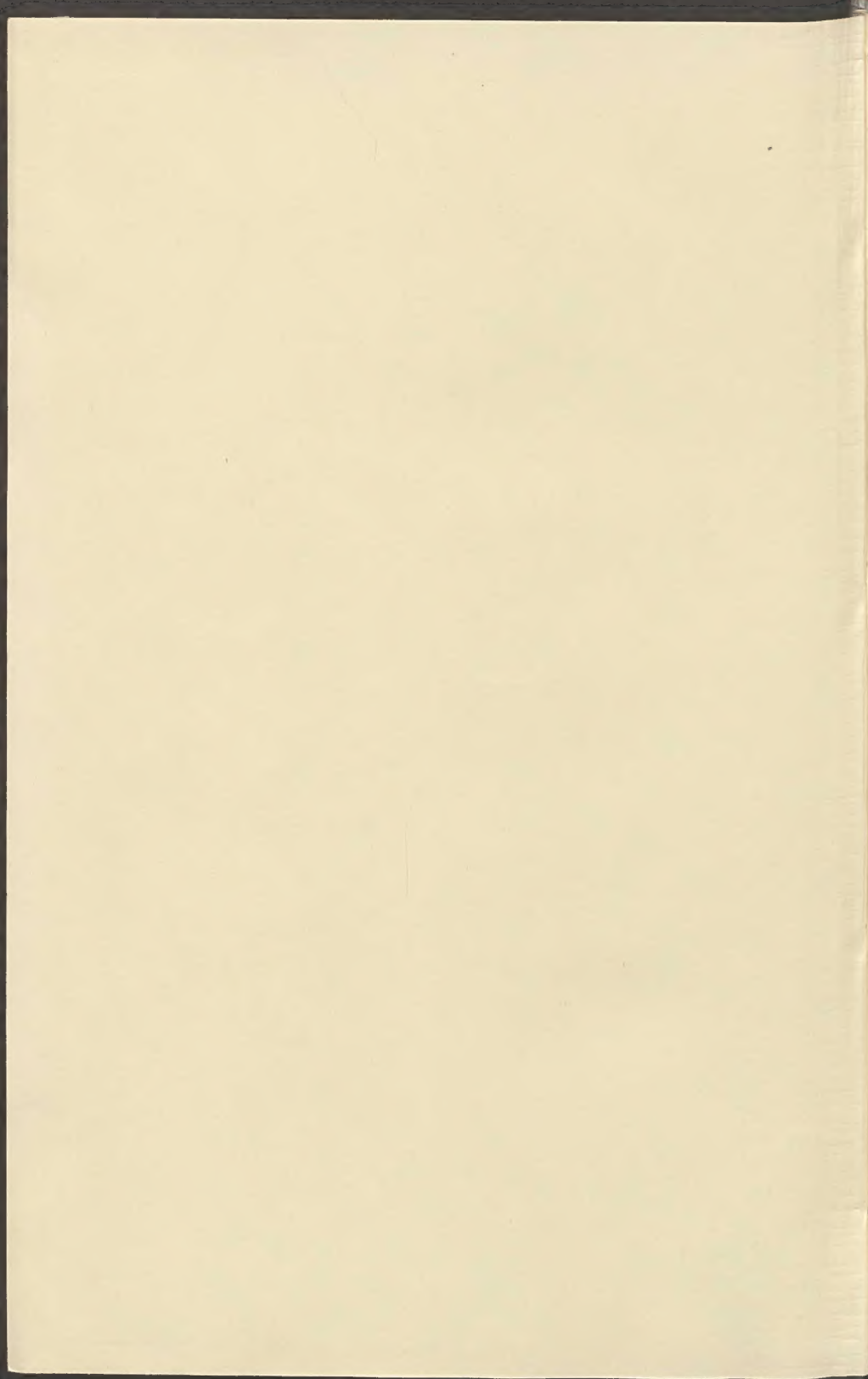
America upon our breakfast-table in the morning, as we now do from Austria and France. A great blow will have been given to that rash spirit of speculation, which, so long as it exists, will always end in those fearful commercial crises which bring ruin on thousands. Another bond of civilization will have been formed. The Queen may speak with her subjects, the merchant with his correspondents, the public with their friends. The great gulf which separates the two countries will have been bridged, and an antidote will be found for all those petty irritating jealousies which are constantly arising between the two countries, in instant, mutual explanations. All it requires is energy, determination, and perseverance, to make the North Atlantic Telegraph not a miserable failure, as was the case with the other line, but a permanent, accomplished fact.













Lbs - Íslandssafn



100493252 - 9



